October 3, 2016 Lecturer Dmitri Zaitsev

Course 1213 - Introduction to group theory 2018

Sheet 1

Due: at the end of the tutorial

Exercise 1

Show the relations for abritrary sets A, B, C:

$$(A \cap B) \cap C = A \cap (B \cap C), \quad (A \cup B) \cup C = A \cup (B \cup C),$$

$$(A \cap B) \cup C = (A \cup C) \cap (B \cup C), \quad (A \cup B) \cap C = (A \cap C) \cup (B \cap C),$$

$$(A \cap B) \setminus C = (A \setminus C) \cap (B \setminus C), \quad (A \cup B) \setminus C = (A \setminus C) \cup (B \setminus C),$$

$$A \setminus (B \cup C) = (A \cup C) \setminus (B \cup C), \quad (A \cap C) \setminus B = (A \cap C) \setminus (B \cap C).$$

Exercise 2

Prove or disprove the relations for arbitrary sets A, B, C:

$$A \times B = B \times A, \quad (A \times B) \times C = A \times (B \times C),$$

$$A \times (B \cup C) = (A \times B) \cup (A \times C), \quad A \times (B \cap C) = (A \times B) \cap (A \times C),$$

$$(A \times B) \cap C = (A \cap C) \times (B \cap C), \quad (A \times B) \cup C = (A \cap C) \times (B \cup C).$$

Exercise 3

Give an example of an infinite family of sets $(S_\alpha)_{\alpha \in A}$ such that

$$\bigcap_{\alpha \in A} S_\alpha = \emptyset$$

whereas every finite subfamily of (S_α) has a nonempty intersection.